BI-AXIAL SWIVEL MECHANISM IN ELECTRONIC APPARATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an electronic apparatus such as a cellular or mobile phone terminal. In particular, the invention relates to a cellular phone terminal of a so-called flip or clamshell type.

2. Description of the Prior Art

A cellular or mobile phone terminal of a so-called clamshell type is well known. The cellular phone terminal of the type includes a main enclosure exposing ten keys at the front surface. A display enclosure is coupled to the main enclosure for rotation around a rotation shaft parallel to the front surface of the main enclosure. The display enclosure is superposed on the front surface of the main enclosure through the rotation around the rotation shaft.

A support shaft is fixed to the main enclosure. The support shaft stands upright from the front surface of the main enclosure. An annular member is coupled to the support shaft for relative rotation. The annular member is designed to receive the aforementioned rotation shaft. The rotation shaft is thus allowed to rotate around the support shaft. The display enclosure may oppose the screen of the display panel to the front surface of the main enclosure, or may alternatively expose the screen of the display panel outside, when the display enclosure is superposed on the front surface of the main enclosure.

For example, the display panel within the display enclosure should be connected to a printed circuit board within the main enclosure through wiring. A hollow space is defined within the support shaft so as to penetrate through the support shaft along the longitudinal axis. Likewise, a hollow space is defined within the rotation shaft so as to penetrate through the rotation shaft along the longitudinal axis. Wires run through the hollow spaces one after another. Accordingly, an additional space must be kept around the rotation shaft for accommodating the wires.

SUMMARY OF THE INVENTION

It is accordingly an object of the present invention to provide a bi-axial swivel mechanism greatly contributing to a reduced volume of an electronic apparatus such as a cellular or mobile phone terminal.

According to a first aspect of the present invention, there is provided an electronic apparatus comprising: first and second enclosures; a socket fixed to the first enclosure; a support shaft received in the socket for relative rotation; a first hollow space penetrating through the support shaft along the longitudinal axis of the support shaft; a first hollow member extending in a first direction from the tip end of the support shaft along an imaginary plane intersecting with the longitudinal axis of the support shaft, said first hollow member defining a second hollow space extending in the first direction; a rotation shaft received in the second hollow space so as to couple the second enclosure to the first enclosure for relative rotation; a second hollow member extending in a second direction opposite to the first direction from the tip end of the support shaft along the imaginary plane, said second hollow member defining a third hollow space extending in the second direction from the tip end of the first hollow space; and a wire penetrating through the first and third hollow spaces.

The electronic apparatus of the type allows penetration of the wire through the first and third hollow spaces. The wire is thus extending from the first enclosure to the second enclosure. The third hollow space extends in the second direction from the tip end of the first hollow space, so that the third hollow space is continuous with the first hollow space. No additional space is required around the second hollow member for locating the wire. The electronic apparatus is thus allowed to enjoy a reduced size or volume.

The electronic apparatus may further include: a first elongated depression formed on the outer periphery of the support shaft all over the entire length of the first hollow space; a first insert member received in the first elongated depression at the outer periphery of the support shaft, said first insert member defining the first hollow space in the first elongated depression; a second elongated depression formed on the outer periphery of the second hollow member all over the entire length of the third hollow space; and a second insert member received in the second elongated depression at the outer periphery of the second hollow member, said second insert member defining the third hollow space in the second elongated depression.

The electronic apparatus of the type allows an easy arrangement of the wire within the first and second elongated depressions. After the first and second insert members have been received in the first and second depressions, the first and second elongated depressions are closed to define the first and third hollow spaces containing the wire. The electronic apparatus can be assembled in this manner in a facilitated manner. Moreover, the first and second insert members serve to reinforce the strength of the support shaft and the second hollow member.

A predetermined bi-axial swivel mechanism may be provided to realize the aforementioned electronic apparatus. The swivel mechanism may comprise: a socket fixed to an enclosure; a support shaft received in the socket for relative rotation; a first hollow space penetrating through the support shaft along THE longitudinal axis of the support shaft; a first hollow member extending in a first direction from THE tip end of the support shaft along an imaginary plane intersecting with the longitudinal axis of the support shaft, said first hollow member defining a second hollow space extending in the first direction; and a second hollow member extending in a second direction opposite to the first direction from the tip end of the support shaft along the imaginary plane, said second hollow member defining a third hollow space extending in the second direction from the tip end of the first hollow space. In this case, the first and third hollow spaces are designed to receive the insertion of a wire. No additional space is required around the second hollow member for locating the wire as described above. The swivel mechanism of the type surely contributes to a reduction in the size or volume of an electronic apparatus in the aforementioned manner.

The bi-axial swivel mechanism may further comprise: a first elongated depression formed on the outer periphery of the support shaft all over the entire length of the first hollow space; a first insert member received in the first elongated depression at the outer periphery of the support shaft, said first insert member defining the first hollow space in the first elongated depression; a second elongated depression formed on the outer periphery of the second hollow member all over the entire length of the third hollow space; and a second insert member received in the second elongated depression at the outer periphery of the second hollow member, said second insert member defining the third hollow space in the second elongated depression.